



TYPE 230-PM COMBINATION CONTROLLER



CONTROLLER ON SHIPPING PALLET

IMPORTANT FEATURES & BENEFITS

- + Vertical Equipment Arrangement for fast and safe maintenance
- + Visible break Isolating Switch for maximum safety
- + Vacuum break Contactor for long contact life
- + Corrosion Resisting Design of All Components and Enclosure
- + U. L. Review and Testing to assure compliance with safety standards
- + Coordinated Design of Elliott manufactured Components
- + Made in U.S.A. to ANSI/UL 347 Standard for Safety.

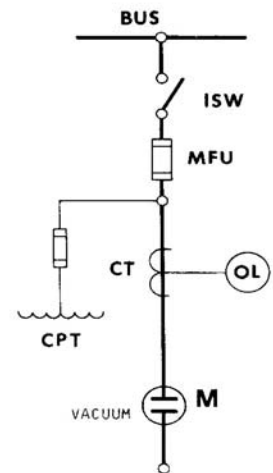


SCOPE & SUMMARY

This bulletin outlines applications, design features, construction, equipment arrangement, and space planning, for the Type 230-PM controllers. These controllers are for the control and protection of induction motors or transformers on 2400-4160-volt systems. The 230-PM controllers are especially designed for outdoor use in Class I, Division 2 hazardous locations.

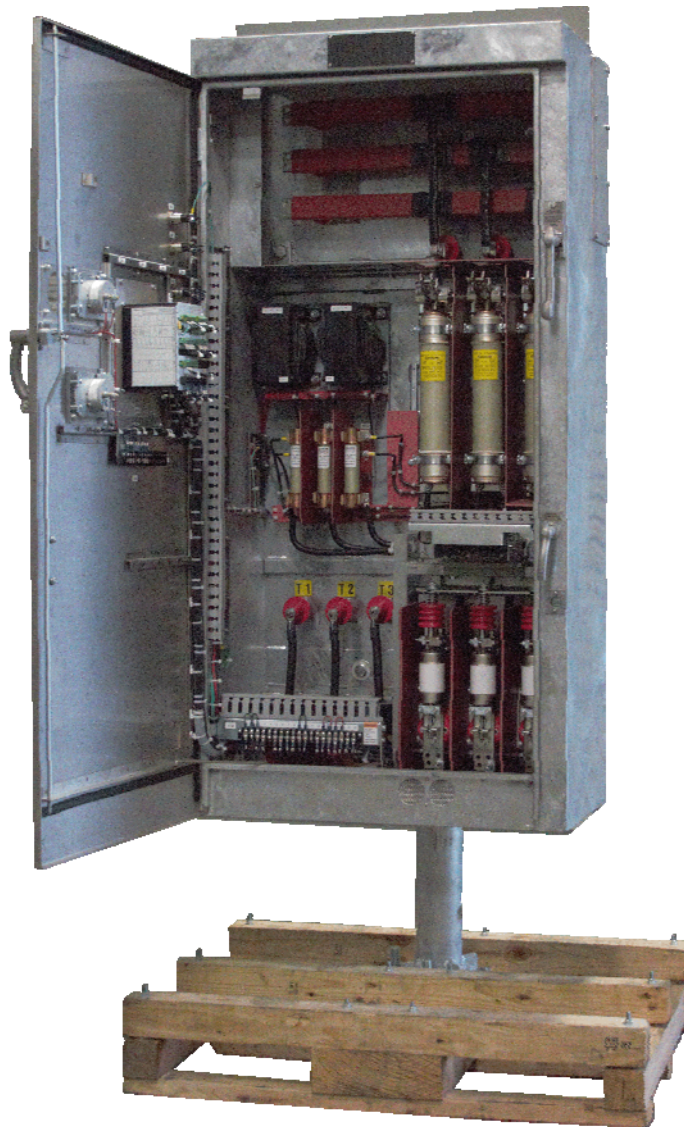
Each Type 230-PM controller is a Class E2 coordinated combination of heavy-duty vacuum contactor, thermal overload relay or multi-function protective relay, current transformers, and current-limiting fuses, with safety-interlocked isolating switch. To assure conformance to OSHA requirements, the basic design and most optional features have been reviewed and tested by UL.

ONE-LINE DIAGRAM





TYPE 230-PM COMBINATION CONTROLLER



APPLICATIONS

GENERAL The 230-PM controllers are for full-voltage, non-reversing, magnetic starting and protection of induction motors. Or they may be used to switch and protect transformers. Optionally, the contactor may be mechanically "latched" for transformer or feeder applications. Alternate designs are available for reduced-voltage starting and for synchronous motor control.

FAULT CURRENT RATINGS The fault interrupting rating is 50 kA at 5,000 VAC. The main bus and ground bus are rated short time current 40 kA 0.167 seconds duration with rated momentary withstand current 62 kA/104 peak.

LOADS The 230-PM controller is made in two continuous current ratings: 180-amp and 360-amp. These ratings typically may be used for control of induction motors up to 700-HP and 1500-HP at 2400-volts or up to 1250-HP and 2500-HP at 4160-volts, or higher HP depending upon service factor and locked rotor current. All controller ratings incorporate the same 360-amp contactor but differ in fuse sizes and cabinet arrangements.

LOCATION The 230-PM controllers are particularly suited to outdoor installation and to other installations where protection from dust or corrosive conditions is desirable. The basic design and most optional features are suitable for Class I, Division 2, T3C hazardous locations.



TYPE 230-PM COMBINATION CONTROLLER

DESIGN FEATURES & CONSTRUCTION

GENERAL Each 230-PM Controller is a Class E2 coordinated combination of a heavy-duty vacuum contactor, overload relay or multi-function protective relay, current transformers, and current limiting fuses, with safety-interlocked isolating switch. These major elements, with the accessory and optional parts, are metal-enclosed, factory assembled, and interconnected. The controller is front-connected with all parts readily accessible. The power elements are arranged vertically for easy and safe installation, operation, and maintenance.

STANDARDS & TESTING The Type 230-PM Controllers are made in U.S.A. to U.S.A. standards, especially ANSI/UL-347. To meet OSHA requirements, the basic design and most optional features have been submitted for "third party review" to Underwriters Laboratories (U.L.).

OPERATION A heavy-duty vacuum contactor is the power switching element. It is controlled through a DC master relay by the customer's 115-VAC pushbutton or other master element, with control power from a self-contained transformer. Optionally, start and stop control switches may be included in the controller. The contactor stays closed on momentary voltage dips but opens on prolonged loss-of-voltage.

PROTECTION Three main-line fuses and control transformer primary fuses provide high-speed fault protection with current-limiting effect. A 3-element, ambient-compensated thermal overload relay provides running overcurrent protection. Optionally, a multi-function solid-state relay or a microprocessor based, protective relay provides running overload and other motor protection. Optionally, a ground fault protective relay provides system protection on resistance or impedance grounded systems. The fuses are coordinated with the protective relays, so that the contactor interrupts any overcurrents up to locked-rotor current and the fuses interrupt only fault currents that exceed the contactor rating.



CONTACTOR WITH POSITION INDICATOR

SAFETY The isolating switch is manually operated to isolate the controller and the circuit from the power supply. The isolating switch may be padlocked open or closed. The enclosure may be padlocked closed. A viewing window permits checking the isolating switch position when the cabinet door is closed. Mechanical interlocks prevent opening the door before opening the isolating switch or closing the isolating switch with the door open. An ammeter shows load current.

ENCLOSURE & MOUNTING The controller enclosure consists of a control cabinet mounted on a support-frame. The cabinet is gasketed, weather-resistant, and ventilated dusttight, with space heater. A unique cabinet and door arrangement makes the cabinet raintight in a 65-mph wind even if the door gaskets are removed. Grouped controllers are equipped with self-contained, interconnecting main-bus and are mounted on a common support-frame side-by-side and/or back-to-back.

LIVE PARTS BARRIER When the isolating switch is open and the door may be opened, the line contacts of the isolating switch and the incoming-line terminals or bus, are the only parts still energized. These parts are at the top of the cabinet. Accidental contact with these energized parts is prevented by a vertical, grounded "Live Parts Barrier" and by a horizontal barrier. A maintenance shutter is available for added safety when working near the live parts.

ISOLATING SWITCH The safety-interlocked isolating switch is 3-pole, gang-operated, with external operating handle. Contact travel is vertical, and the air-gap is easily seen when the switch is open. To prevent accidental operation under load, the isolating switch and the main contactor are mechanically interlocked with a control-power switch which is externally operated. The isolating switch may be opened or closed only when the control-power switch is in the "stop" position and the main contactor is open.

FUSES The main-line fuses are ribbon element, totally enclosed, and non-vented, mounted in fixed position with bolted-in fuse-clamps. When these fuses interrupt, there is no noise and any pressure generated is self-contained and sealed. These fuses exhibit an increase in resistance when melting, so that they have a current limiting effect on major fault currents. For Class I, Division 2 applications, these fuses are completely sealed (without operation indicators).

CONTACTOR The heavy-duty vacuum contactor is solenoid operated, and the solenoid is energized through a rectifier at 115-volts. The contactor is designed and tested for high momentary current-carrying and reliable current-interrupting. Auxiliary contacts are hermetically-sealed. The contactor includes a position indicator with viewing window.

FINISH The cabinet door is stainless steel. The cabinet, support-frame, and incoming line box are hot-dip galvanized after fabrication. External hardware, shafts, pins, and springs, are stainless steel. Current-carrying contacts and connections are hermetically-sealed or specially plated for corrosion resistance.



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EQUIPMENT ARRANGEMENT

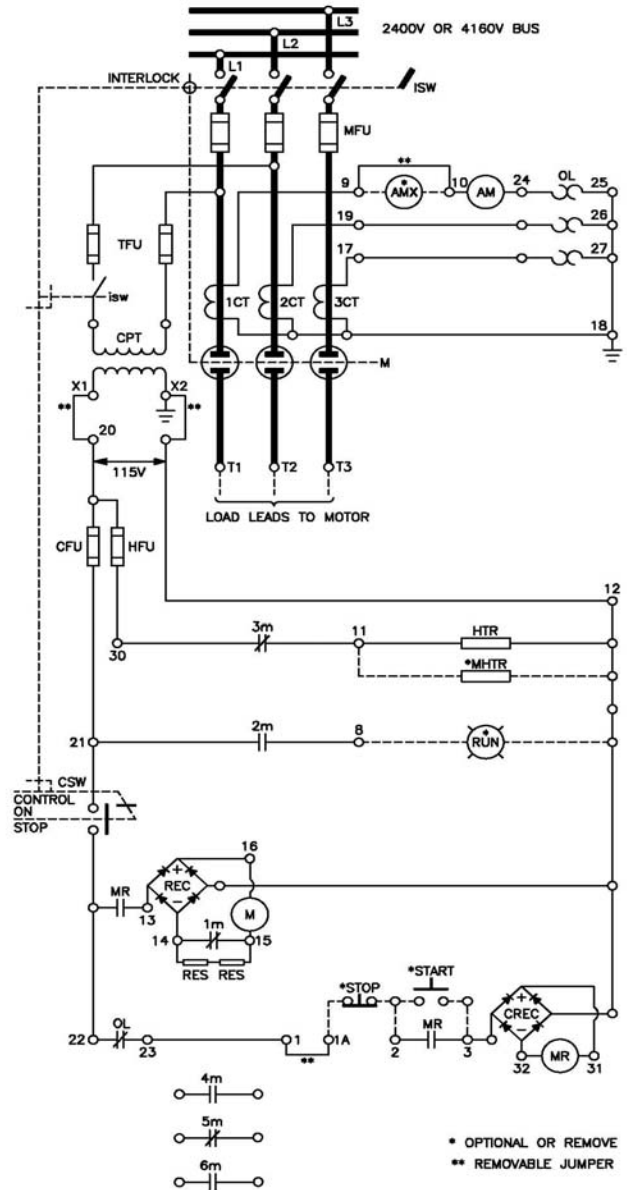
Mounted in the Control Cabinet—

- L1/3 Incoming Line Connectors
- BUS Main Bus
- GBUS Ground Bus
- ISW Isolating Switch with Interlocks
- MFU Main Line Fuse
- M Vacuum-break Contactor with Position Indicator
- TFU Transformer Primary Fuse
- isw HV Auxiliary Switch on ISW
- CPT Control Power Transformer
- CT Current Transformer
- OL Overload Relay
- AM Ammeter
- T1/3 Load Terminal Connector
- CFU Control Fuse
- HFU Heater Fuse
- CSW Stop-On Control-Power Switch
- REC Rectifier for Contactor Coil
- RES Resistor for Contactor Coil
- m Auxiliary Contact on Contactor
- MR Master Control Relay
- CREC Rectifier for MR
- HTR Space Heater
- TB Control Terminal Block
- Application Nameplate 3" x 8"

Optional Features Include—

- Manual-Reset of Overload Relay
- Ground Fault Relay
- Multi-function Protective Relay
- Extra Auxiliary Contacts
- Time-Delay Reclosing Relay
- Start & Stop Control Switches
- Hand-Off-Auto Selector Switch
- AC Ammeters in All Phases
- Mechanically "Latched" Contactor
- Foreign Voltage Switch
- A C Voltmeter
- Indicating Lights

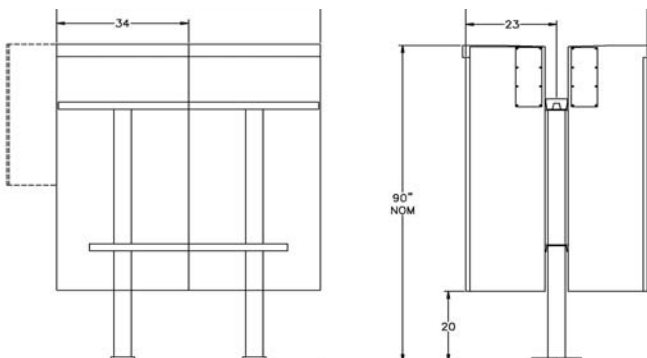
SCHEMATIC DIAGRAM



SPACE PLANNING

SPACE REQUIRED Each controller is 34-in. wide by 20-in. deep, 90-in. high overall when mounted on support-frame 6-in. deep. When grouped, the controllers are mounted side-by-side and/or back-to-back with interconnecting bus. Suggested minimum working clearance in front of each controller is 4-ft.

CONDUIT ENTRANCES An order-related outline drawing will show suggested location for field installed conduit entrance locations. For underground conduit entrances, knockouts are provided in bottom of controller cabinet.



OUTLINE DIMENSIONS FOR FOUR CONTROLLERS
DIMENSIONS IN INCHES